

***** ABSTRACT ONLY *****

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Fire Modeling in Interactive Virtual Environments

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ABSTRACT

One of the most exciting application domains of “virtual reality” technology is collaborative design, where scientists, engineers, architects, and other professionals can enter a virtual space that allows the physical structure of a system to be evaluated without actually building, creating, or affecting a real instance of that structure. Users could preview architectural designs, evaluate their performance with various real-world metrics, and do simulations and “what-if” experiments cheaply and with no risk. We are attempting to realize some of these advantages for the benefit of fire safety in architectural environments.

This work is based on a project to integrate the National Institute of Standards and Technology’s (NIST) Consolidated Model of Fire and Smoke Transport (CFAST) into the Berkeley Architectural Walkthrough (Walkthru) system. CFAST currently provides the world’s most accurate computer simulation of the impact of fire and its byproducts on a building environment; Walkthru is an ongoing project at Berkeley that provides real-time (10 frames per second), interactive, three-dimensional walkthroughs of architectural environments derived from AutoCAD floorplans. Together, they provide real-time, intuitive, realistic and scientific visualization of building conditions in a fire hazard situation from the perspective of a person moving around inside a burning building. The viewer can observe the natural visual effects of flame and smoke in fire hazard conditions; alternatively, scientific visualization techniques allow the user to “observe” parameters such as the concentrations of toxic compounds in the atmosphere or the temperatures of the atmosphere, walls, and floor. Warning and suppression systems such as smoke detectors and sprinkler heads can be observed in action to help determine the effectiveness of those systems. VCR-style controls and point-and-click graphical interfaces simplify interaction with both the fire model and the building model, and our building model generator (BMG) provides the ability to directly derive both CFAST’s architectural data and the Walkthru’s virtual building model quickly from a set of two-dimensional AutoCAD floorplans. The system also allows the use of multiple computers or processors to provide real-time performance for both the simulator and the virtual environment visualizer.